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EXAMINER	
CHOW, CHARLES CHIANG	
ART UNIT	**PAPER NUMBER**
2618	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/19/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/810,685	SHEMESH ET AL.	
	Examiner	Art Unit	
	Charles Chow	2618	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 March 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) *18-39* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *3/292/004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

1. This office action is for applicant's claim election of invention group I, claims 1-17, March 23, 2007.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 3-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter [US 6,654,595 B1] in view of Nguyen et al. [US 6,801,585 B1] and Cook et al. [US 2007/0015,471 A1].

For claim 1, Dexter teaches a method [Fig. 1C, col. 9, lines 5-42 & its related description in the specification; to improve IP3, dynamic range of the mixer, col. 5, lines 9-20] comprising

applying logic operations [switching network 150, Fig. 3; logic on/off state of the 160/170 in col. 12, lines 53-56] to first and second differential pairs of periodic logic signals having a local frequency [the two pairs of local oscillator signals from squaring gates 310/312],

mixing a differential pair of first input signals [rf input to mixer 36a in Fig. 1C] said first differential pair of reference signals [reference signals from 40a] from to produce a differential pair of first output signals [the output of mixer 36a].

Dexter teaches the logic operation from the gate & switching, together with operation in Fig. 29, but fails to teach the applying logic operation to a periodic logic signal having a local frequency and to delayed versions hereof to produce a first differential pair.

Nguyen et al. [Nguyen] teaches the applying logic operation to a periodic logic signal having a local frequency and to delayed versions hereof to produce a first differential pair [the gates in 721 applied logic operation to A/410 & B/delayed 420 in col. 5, lines 5-7, Fig. 7/Fig. 4B, Fig. 6A/Fig. 6B, col. 4, line 56 to col. 5, line 8 & its corresponding description in the specification], in order to improve the local oscillator LO frequency generation with the simple logic gates in 721 & having less LO leakage & pulling [col. 2, lines 44-56]. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to improve Dexter with Nguyen's logic operation for generating LO signal, in order to simply control the LO frequency, together with the Less LO leakage & pulling.

Dexter & Nguyen fail to teach the reference signal having high spectral content at three times said local frequency and relatively low spectral content at other frequency; the first output signal having a dominant spectral component at three time said local frequency less a center frequency of said first input signals.

Cook et al. [Cook] teaches the reference signal having high spectral content at three times said local frequency and relatively low spectral content at other frequency [the LO output. 15.45 GHz, from mixer 622 is at three time the LO frequency of 5.15 GHz, Fig. 6 & its corresponding description in the specification, for the high spectral content at three times said local frequency and relatively low spectral content at other frequency];

the first output signal having a dominant spectral component at three time said local frequency less a center frequency of said first input signals [the output frequency from 606/612 is the difference of rf input to mixer at 0.95-1.7 GHz less the LO frequency at 15.45 GHz, Fig. 6], in order to generate the desired intermediate frequency IF plan by utilizing the three time LO frequency from the single oscillator [paragraph 0002]. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to

upgrade Dexter, Nguyen with Cook's three time LO frequency, such that the desired IF frequency plan could be generated by mixing the input signal with a three times LO frequency.

For claim 3, Dexter teaches the wherein said first input signals are radio frequency singles [rf input to mixer 36a or 36b, Fig. 1C & its corresponding description in the specification] and mixing said differential pair of first input signals [output of 33 to 36a/36b] with said first differential pair of reference signals [the output pair from 40a or 40b] includes down converting said input signal [the down conversion in abstract, col. 1, lines 29-35].

For claim 4, Dexter teaches the said first output signals are radio frequency signals [rf output signals from mixer 36a or 36b] and mixing said differential pair of first input singles with said first differential pair of reference signals [output pair from 40a or 40b] includes up converting said input signal [the up conversion in abstract, col. 1, lines 29-35].

3. Claims 2, 6-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter in view of Nguyen, Cook, as applied to claim 1 above, and further in view of Dujmenovic [US 6,980,787 B1].

For claim 2, Dexter teaches wherein said logic operations also produces a second differential pair of reference signals that is a delayed version of the said first differential pair of reference signals

Dexter & Nguyen fail to teach the mixing a differential pair of second input signals with said second differential pair of reference signals to produce a differential pair of second output signals.

Dujmenovic teaches the mixing a differential pair of second input signals with said second differential pair of reference signals to produce a differential pair of second output

signals [the delayed local oscillator signals from delay cells $44_3/44_4$ of 32 to the second mixer 28 for producing a second output signals from 28, Fig. 2, col. 3, lines 32-46, delay circuit in Fig. 3 & their related description in the specification], for improving the mixer output with less image signal [col. 2, lines 54-59]. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to upgrade Dexter, Nguyen with Dujmenovic's delay cell for local oscillator signals, such that the image signal could be reduced.

Dexter, Nguyen, Dujmenovic fail to teach the second output signal having a dominant spectral component at three times said local frequency less a center frequency of said second input signal.

Cook teaches the second output signal having a dominant spectral component at three times said local frequency less a center frequency of said second input signal [the output frequency from 606/612 is the difference of rf input to mixer at 0.95-1.7 GHz less the LO frequency at 15.45 GHz, Fig. 6], in order to generate the desired intermediate frequency IF plan by utilizing the three time LO frequency from the single oscillator [paragraph 0002]. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to upgrade Dexter, Nguyen, Dujmenovic with Cook's three time LO frequency, in order to generate the desired IF frequency plan with a three times LO frequency.

For claim 6, Dexter, Nguyen, Cook fail to teach the generating of periodic differential pair related to the phase delay of 90 degree, 45 degree.

Dujmenovic teaches the generating said second differential pair of periodic logic signals [output of 44_2, Fig. 2] with a phase delay of 90 degree [two 45 degree delays in cells 44_1,

44_2] relative to said first differential pair of periodic logic signals [relative to the input to 44_1, Fig. 2 & its corresponding description in the specification] with a phase delay of 45 degree [the 45 degree delay in each 44_1, 44_2] relative to said first differential pair of periodic logic signals [relative to the input to 44_1]; and

generating a delayed version of said second differential pair of periodic logic signals with a phase of 45 degree relative to the second differential pair of periodic logic signals [generating delayed second differential pair output from 44_4, with delay cells, 44_3, 44_4, of 45 degree, relative to the second differential pair outputted from 44_2 above], using the same reasoning in claim 2 above to combine Dujmenovic to Dexter, Nguyen, Cook.

For claim 7, Dexter teaches the further comprising the generating first and second differential pairs of substantially sinusoidal local oscillator signals [the sinusoidal outputs from 302, Fig. 3]; and

shaping said first and second differential pair of local oscillation signals [squaring at gate 310, 312, Fig. 3], and

delayed versions thereof to produce said first and second differential pairs of periodic logic signals [the phase splitting in 302 as the providing of delayed version of output and squaring, shaped, by gate 310,312, Fig. 3].

Dexter, Nguyen, Cook fail to teach the delayed versions thereof.

Dujmenovic teaches the delayed versions thereof [the delayed version outputted from 44_2 to mixer 30 & the delayed version outputted from 44_4 to mixer 28, Fig. 2], using the same reasoning to combine Dujmenovic to Dexter, Nguyen, Cook.

For claim 8, Dexter teaches the sinusoidal local oscillator signal [col. 9, lines 5-21]. Dexter, Nguyen, Cook, fail to teach the generating of periodic differential pair related to the phase delay of 90 degree, 45 degree.

Dujmenovic teaches the wherein generating said first and second differential pairs of substantially sinusoidal local oscillator signals the includes generating said second differential pair of local oscillator signals with a phase delay of 90 degree relative to said first differential pair of local oscillator signals [the second pair at the output of 44_4 is 90 degree from the first pair outputted from the 44_2, Fig 2]; and said method further comprising

generating a delayed version of said first differential pair of periodic local oscillator signals with a phase of 45 degree relative to said first differential pair of periodic local oscillator signals [the generating of 45 degree delayed first pair at output 44_3] and

generating a delayed version of said second differential pair of periodic local oscillator signals with a phase of 45 degree relative to said second differential pair of periodic local oscillator signals [the generating of 45 degree delayed first pair at output 44_4], using the same reasoning in claim 2 above for combining Dujmenovic to Dexter, Nguyen, Cook.

4. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter in view of Nguyen, Cook, as applied to claim 1 above, and further in view of Pigeon [US 5,436,938].

For claim 5, Dexter, Nguyen, Cook fail to teach the logic value interlaced with three portions at different logic value.

Pigeon teaches the wherein applying said logic operations includes applying said logic operations to produce said first differential pair of reference signals having a periodic pattern of three portions at a logic value interfaced with three portions at a different logic value [to generate vcro frequency E2 which is three times the input reference oscillator frequency, by interlacing, applying, the three portions of the logic value, from the signals C1, T1, T2, via gates 28/30, 32/34, Fig. 1, Fig.2/Fg.1, col. 4, line 38 to col. 5, line 6], in order to simply generate a local oscillator frequency which is three times the input reference oscillator

frequency, by using the delays & exclusive OR logic gates. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to upgrade Dexter, Nguyen, Cook with Pigeon's logic gates & delays, in order to conveniently generate a local oscillator frequency which is three times the input reference oscillator frequency, by using the delays & exclusive OR logic gates.

5. Claims 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter in view of Martinson et al. [US 5,446,923].

For claim 9, Dexter teaches the generating of first and second differential pair from phase splitter 302 in Fig. 3. having relative low spectral of three time said local frequency.

Dexter, fails to teach the local oscillator signal having a local frequency and a relatively low spectral content at three times said local frequency with a differential pair of input signals to produces a different pair of output signal having a relative high spectral content at three times said local frequency less center frequency of said input signals.

Martinson et al. [Martinson] teaches the local oscillator signal having a local frequency and a relatively low spectral content at three times said local frequency with a input signal to produces a pair of output signal having a relative high spectral content at three times said local frequency less center frequency of said input signals [the oscillator fundamental frequency fLO from 84, having low three times said local frequency, mixes with input fin 88 to produce an output frequency at fin -3fLo by adjusting the DC bias voltage for the mixer 82, abstract, Fig. 5, col. 4, lines 11-28 & its corresponding description in the specification], in order to control mixer output frequency by conveniently adjusting the DC biasing to the mixer. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to upgrade Dexter with Martinson's DC biasing of the mixer &

fundamental frequency from the local oscillator, such that Dexter's mixing with differential pairs could producing the high spectral content at three times local frequency less center frequency of input signal from the low spectral content at three times local frequency.

For claim 10, Dexter teaches the wherein said input signals are radio frequency signals and mixing said differential pair of input signals with said first and second differential pairs of local oscillator signals includes down conversion [the two output differential pairs from 40a & 40b mixing with rf signal at mixer 36a & 36b, Fig. 1C] includes down converting said input signal [the mixer 36a & 36b are for down conversion in abstract, col. 1, lines 29-35].

For claim 11, Dexter teaches the wherein said output signals are radio frequency signals and mixing said input signals with said first and second differential pairs of local oscillator signals includes up conversion [the outputting rf signal by mixing the two differential output pairs from 40a & 40b at mixer 36a & 36b, Fig. 1C] includes down converting said input signal [the mixer 36a & 36b are for up conversion in abstract, col. 1, lines 29-35].

6. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter in view of Martinson, as applied to claim 9 above, and further in view of Dujmenovic-'787 B1.

For claim 12, Dexter teaches generating said first and second differential pairs of local oscillator signals as substantially sinusoid signal [output from 302],

Dexter fails to teach the such that said second differential pair of local oscillator signals has a phase difference relative to said first differential pair of local oscillator signals wherein an absolute value of said phase difference is substantially 90 degree.

Dujmenovic teaches the such that said second differential pair of local oscillator signals has a phase difference relative to said first differential pair of local oscillator signals wherein

an absolute value of said phase difference is substantially 90 degree [the second pair at the output of 44_4 is 90 degree from the first pair outputted from the 44_2, Fig 2], using the same reasoning in claim 2 above for combining Dujmenovic to Dexter, Martinson.

For claim 13, Dexter teaches the wherein mixing said first differential pair of local oscillator signals with said differential pair of input signals [mixing rf input with output of 40a at mixer 36a, Fig. 1C],

Dexter fails to teach the generating a differential pair of mixer signals having half said phase difference relative to said first differential pair of local oscillator signals.

Dujmenovic teaches the generating a differential pair of mixer signals having half said phase difference relative to said first differential pair of local oscillator signals [the output pairs at 443 is 45 degree which is half the phase difference in Fig. 1C & its corresponding description in the specification], using the same reasoning in claim 2 above for combining Dujmenovic to Dexter, Martinson.

7. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter in view of Kluge et al. [US 7,085,548 B1] and Martinson-'923.

For claim 14, Dexter teaches a method comprising mixing first and second differential pair of local oscillator signals having a local frequency [two differential pair from 40a, 40b, Fig. 1c & its corresponding description in the specification], for producing differential output signal from mixer 36a, 36b [Fig. 1C, its corresponding description in the specification].

Dexter teaches the fails to teach the mixing first, second and third differential pairs of local oscillator signals having a local frequency; the relatively low spectral content at three times said local frequency of input signals to produce the output signals having a relative

high spectral content at three times said local frequency less a center frequency of said input.

Kluge et al. [Kluge] teaches the mixing first, second and third differential pairs of local oscillator signals having a local frequency [the at least three differential pairs of the local oscillator signals from 50 & Rx buffer are supplied to the mixer switches 51-54, having different phase relationship, for mixing with Rx 2400 MHz input, Fig. 9, col. 6, line 20 to col. 7, line 6], to reduce the interference from the spurious signal [col. 2, lines 1-11]. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to upgrade Dexter with Kluge's multi-phase oscillator signal, such that the interference from the spurious signal could be reduced.

Dexter, Kluge fail to teach the relatively low spectral content at three times said local frequency mixing with a input signal to produce the output signals having a relative high spectral content at three times said local frequency less a center frequency of said input.

Martinson teaches the relatively low spectral content at three times said local frequency mixing with a input signal to produce the output signals having a relative high spectral content at three times said local frequency less a center frequency of said input [the oscillator fundamental frequency fLO from 84, having low three times said local frequency, mixes with input fin 88 to produce an output frequency at fin -3fLo by adjusting the DC bias voltage for the mixer 82, abstract, Fig. 5, col. 4, lines 11-28 & its corresponding description in the specification], in order to control mixer output frequency by conveniently adjusting the DC biasing to the mixer. Therefore, It would have been obvious to one of ordinary skill in the art at the time the invention was made to upgrade Dexter, Kluge with Martinson's DC biasing of the mixer & fundamental frequency from the local oscillator, such that Dexter's mixing with differential pairs could producing the high spectral content at three times local

frequency less center frequency of input signal from the low spectral content at three times local frequency.

For claim 15, Dexter fails to teach the mixing of first, second and third differential pairs of local oscillator signals.

Kluge teaches the wherein input signals are radio frequency signals and mixing said differential pair of input signals with said first, second and third differential pairs of the local oscillator signals includes down conversion said input signal [the at least three differential pairs of the local oscillator signals from 50 & Rx buffer are supplied to the mixer switches 51-54, having different phase relationship, for mixing with Rx 2400 MHz input, Fig. 9, col. 6, line 20 to col. 7, line 6; the down conversion from Rx 2400 to I, Q signals in Fig. 9 & its corresponding description in the specification], using the same reasoning in claim 14 above for combining to Dexter, Martinson.

For claim 16, Dexter fails to teach the mixing of first, second and third differential pairs of local oscillator signals.

Kluge teaches the wherein output signals are radio frequency signals and mixing said differential pair of input signals with said first, second and third differential pairs of the local oscillator signals includes up conversion said input signal [the at least three differential pairs of the local oscillator signals from 50 & Tx buffer are supplied to the mixer switches 55-58, having different phase relationship, for producing output signal Tx 2400 MHz input, Fig. 9, col. 6, line 20 to col. 7, line 6; & its corresponding description in the specification], using the same reasoning in claim 14 above for combining to Dexter, Martinson.

8. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dexter in view of Martinson, as applied to claim 14 above, and further in view of Nguyen et al. [US 6,801,585 B1].

For claim 17, Dexter teaches the generating of differential pairs of sinusoidal signals [col. 9, lines 5-21].

Dexter fails to teach the generating said first, second, third differential pairs of local oscillator signals such that said third differential pair of local oscillator signals has a phase difference relative to said first differential pair of local oscillator signals.

Martinson teaches the generating said first, second, third differential pairs of local oscillator signals such that said third differential pair of local oscillator signals has a phase difference relative to said first differential pair of local oscillator signals [the third local oscillator differential pair inputted to mixer 54 which has a phase difference relative to the first local oscillator differential pair inputted to the mixer 51, Fig. 9 & its corresponding description in the specification], using the same reasoning in claim 14 to combine Martinson to Dexter.

Dexter, Martinson fail to teach the wherein an absolute value of said phase differential is substantially 120 and said second differential pair of local oscillator signals has half said phase difference relative to said first differential pair of local oscillator signals.

Nguyen teaches the wherein an absolute value of said phase differential is substantially 120 and said second differential pair of local oscillator signals has half said phase difference relative to said first differential pair of local oscillator signals [the delay of local oscillator signal B/420 can be any amount of degrees between 0 and 180, such as 85 degree, could be obviously 120 degree or a half of 120 degree, col. 5, lines 1-8], in order to generate proper phase shifted local oscillator signal for reducing IP3. Therefore, It would have been

obvious to one of ordinary skill in the art at the time the invention was made to upgrade Dexter, Martinson with Nguyen's any amount of phase shifting between 0 & 180 degree, such the IP3 could be reduced.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A. Kohama [US 5,812,939] teaches the four branches in Fig. 8 for the FET transistor switches.

B. Sorrells et al. [US 6,704,558 B1] teaches the sine wave to square wave converter 310 in Fig. 3.

C. Namura [Us 7,079,596 B1] teaches the exclusive or citcuit 413 in Fig. 1 for generating local oscillator signal to mixer 610,156.

D. Lee et al. [US6,512,408 B2] teaches the multi-phase local oscillator signal generation with plurality of delayed local oscillator signals LO(0) to LO(N-1) for combine at 200B for the mixer 200A [Fig. 2B, Fig. 4A to Fig. 4F & its corresponding description in the specification].

E. Other prior arts are also considered. They are: Otaka [US 6,148,181], Scherer et al. [US 5,844,939], Wang [US 6,529,052 B2], Craninckx [US 2005/0148,310 A1], Hashimoto et al. [US 5,262,735], Pengelly et al. [US 5,898,913], Petro et al. [US 7,139,546], Dornbusch [US 2005/0266,821 A1], Puechberty et al. [US 6,026,287], Dai et al. [US 6,469,585 B1].

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Chow whose telephone number is (571) 272-7889. The examiner can normally be reached on 8:00am-5:30pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban can be reached on (571) 272-7899. The fax phone number for the organization where this application or

proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Charles Chow C.C.

April 4, 2007.

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